

REMARKS

This response follows the new format for amendments filed in Art Unit 2827.

Claim 8 was rejected under §112, first paragraph, due to lack of support for the subject matter of dependent claim 11. Support for this subject matter is found in Figure 2 of the present application that depicts the prior art reinforcing pads 13a-d at the corners of the mounting surface and solder balls 12 not on these reinforcing pads. The present invention is directed to improving the reinforcing pads at the corners of the mounting surface and one of skill in the art will appreciate that the prior art solder balls 12 shown in Figure 2 may be retained in an embodiment of the present invention. Reconsideration and withdrawal of the rejection are respectfully requested.

Claims 8 and 11 were rejected as anticipated by POTTER et al. 6,444,563. Reconsideration and withdrawal of the rejection are respectfully requested.

Please note that a copy of POTTER et al. was not provided with the Official Action and the reference is not listed on the PTO-892. While applicant has obtained a copy of the reference, a new PTO-892 listing this reference is respectfully requested.

POTTER et al. disclose a method in which plural solder balls 14 are included on one corner mounting pad 22 (Figure 5, Before Reflow). This is an interim step and does not represent

the final product after the device is joined to a circuit board. As shown in Figure 5 (After Reflow) and discussed at column 3, line 67, through column 4, line 34, the plural solder balls 14 merge to form a single larger solder ball and this larger solder ball is used to attach the device to a circuit board. The larger ball apparently improves the reliability of the joint at the corners (Abstract).

While it is believed that POTTER et al. do not fairly teach the subject matter of claim 8, claim 8 has been amended to provide that the claimed first solder balls separately attach the semiconductor device to the circuit board. That is, and in contrast to what is disclosed in POTTER et al., the claimed first solder balls are separate when the device and board are joined. Accordingly, claim 8 avoids the rejection under §102.

Claims 9, 10, and 12 were rejected as unpatentable over POTTER et al. in view of DARVEAUX et al. 6,201,305. Reconsideration and withdrawal of the rejection are respectfully requested.

Claim 9 provides that the reinforcing pad is generally X-shaped and that there are solder balls at each of the four distal ends of the X-shape (such as shown in Figure 5A of the present application). Claim 10 provides that the reinforcing pad is generally V-shaped and that there are solder balls at each of the two distal ends thereof (such as shown in Figure 5B of the present application). DARVEAUX et al. do not disclose that

solder balls are at each of the distal ends of the X-shape (it has one solder ball in the middle) and thus the two references do not disclose or suggest the specific shapes claimed. Accordingly, claims 9 and 10 avoid the rejection under §103.

The Official Action also states that the shapes would have been a matter of design choice, absent evidence of criticality of the shape. However, such criticality has been addressed in the present application. One of the problems of the prior art (page 2, lines 11-17) is that mechanical stress concentrates at edge portions of the reinforcing pads. As further explained at page 6, line 16, through page 8, line 5 (particularly the top of page 8), the stress is concentrated at acute angle portions, such as at the corners of the reinforcing pads shown in Figures 3A-B. The claimed invention avoids this stress by changing the shape of the reinforcing pad so that the stress is distributed over a larger portion of the edge, not just at acute angle portions. The prior art does not recognize that stress can accumulate at acute angle portions and does not suggest shaping the reinforcing pad to avoid such stress accumulation. Note, for example, the statement at column 4, lines 8-10 in POTTER et al. that the reinforcing pads may be square or rectangular.

TSUNEMASU S.N. 10/073,196

In view of the present amendment and the foregoing remarks, it is believed that the present application has been placed in condition for allowance. Reconsideration and allowance are respectfully requested.

Respectfully submitted,

YOUNG & THOMPSON

By

Thomas W. Perkins
Attorney for Applicant
Registration No. 33,027
745 South 23rd Street
Arlington, VA 22202
Telephone: 521-2297

March 20, 2003